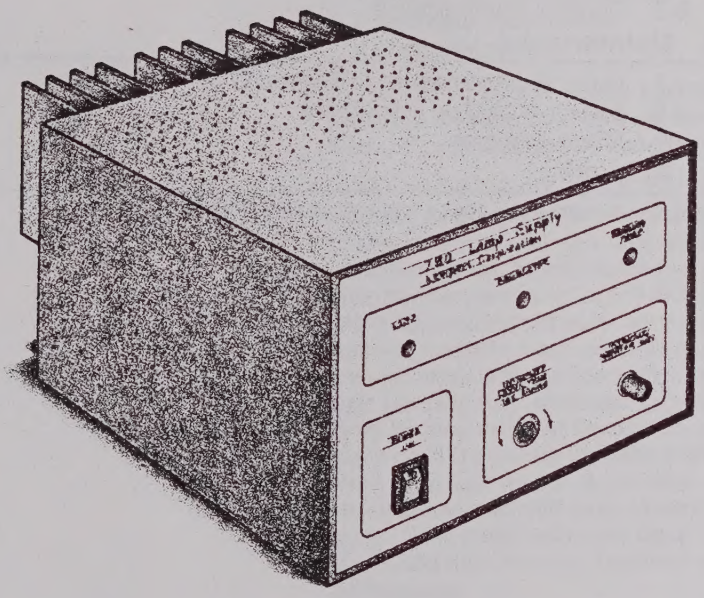
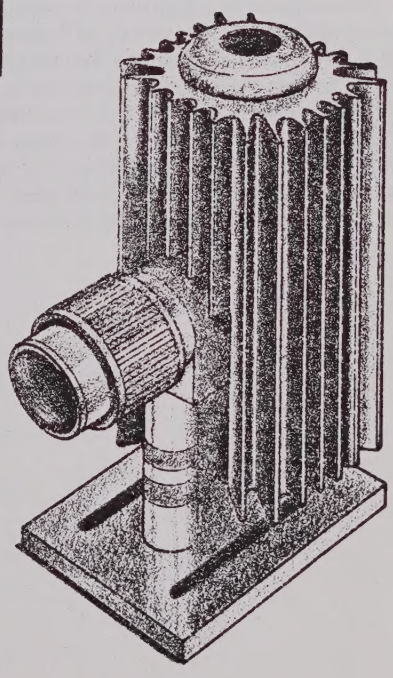
Model 780
Tungsten Halogen
Lamp Source

Including Accessories for 700 Series Lamp Products





Newport

CONTENTS

		Page
1.0	**Introduction**	**2**
2.0	**Description and Specifications**	**3**
2.1	Lamp Housing Assembly	
2.2	Power Supply Assembly	
2.3	700 Series Lamp Product Optional Accessories	
2.3.1	Filters and Filter Holder	
2.3.2	Lens Adaptors	
2.3.3	Fiber Optic Bundles	
3.0	**Operation**	**10**
3.1	First Time Operation	
3.2	Controls and Indicators	
4.0	**Maintenance**	**11**
4.1	Lamp Replacement and Alignment	
4.2	Sensor Amp Gain Adjustment	
4.3	Mirror Alignment	
5.0	**Appendix**	**11**
5.1	Schematics, Parts Lists, Assembly Drawings	

1.0 INTRODUCTION

The Model 780 is a 50 watt tungsten halogen light source designed for use in laboratory and industrial applications where a stable, relatively low radiance source of broadband light is required.

Applications for which the 780 is suited are:

- colorimetry
- photodetector characterization
- geometric optics studies and demonstration
- spectroscopic studies
- radiometry and photometry
- photochemistry
- sensitometry
- photodegradation studies
- general purpose illumination
- fiber optic Illumination
- ultraviolet studies

The 780 consists of a lamp housing assembly and a regulated power supply assembly. A selection of optional accessories is available including optical filters, filter holder, optical mount adapters, and fiber optic bundles.

The Model 780 uses optical feedback stabilization to provide stable short-term and long-term output illumination intensity. The convection cooled lamp housing features a 50 watt tungsten halogen lamp with high efficiency light collection optics. An adjustable focusing lens assembly allows reimaging of the lamp filament over a range of 8 inches to infinity from the end of the lens housing. Other features include easy lamp replacement and realignment, minimal light leakage, intensity range adjustment, ease of mounting and compatability with Newport optical tables and components. The power supply provides precise light intensity regulation using a temperature controlled photosensor in the lamp housing to detect fluctuation of the lamp filament light output. A front panel control provides intensity adjustment over a range of 80% to 100% of full rated lamp light output. A precision analog intensity output monitor permits use of an external voltmeter to reset the controls to better than 0.1% of full range. Front panel indicators signal lamp load status, housing temperature status, and light intensity regulator status to verify correct in-range controller performance.

2.0 DESCRIPTION AND SPECIFICATIONS

2.1 Lamp Housing Assembly

The lamp housing assembly contains the lamp, lamp socket and adjustable base assembly, a thermoelectrically cooled photosensor for monitoring the lamp filament output intensity, light collection mirrors, and an adjustable focusing lens assembly for projecting a collimated beam. A 6 foot long cable attached at the lamp base assembly connects the lamp to the power supply.

The 780 uses a 12 volt, 50 watt tungsten halogen lamp. A compound elliptical/spherical mirror system collects the light from the lamp filament. See Figure 2. The rear mirror focuses light at the aperture plate to form a primary image of the filament with a magnification factor of approximately 4×. Light collection efficiency is enhanced by the spherical retroreflector which collects light radiated in the forward direction and reflects it back upon the filament.

A removable aperture plate is located at the primary focus of the collecting optics system. This aperture produces a round, uniform well-defined light beam when projected through the focusing lens. The focusing lens is a single element fused quartz optic with a two inch focal length and a clear aperture of one inch. An adjustment collar on the assembly allows axial motion of the lens to image the plate aperture over a range of eight inches to infinity from the end of the lens assembly. The effective divergence of the beam with the lens focused at infinity is determined by dividing the aperture diameter (.19 inches) by the lens focal length (2.0 inches) to obtain a full angle divergence of 5.4 degrees. Three adjustment thumbscrews located at the bottom of the lamp housing allow centering the lamp filament image on the aperture plate.

A thermoelectrically cooled silicon photodiode is mounted at the base of the lamp. A light pipe samples the light from the lamp filament. The photodiode generates a signal which is fed back to the power supply. The temperature of the silicon photodiode is controlled at approximately 25°C to minimize sensitivity to housing temperature variation. This is accomplished by sensing the detector temperature with a thermistor and controlling the current in the thermoelectric cooler. The photodetector, thermistor, and cooler device are all integrated into a single module located at the base of the lamp socket.

The lamp housing is an aluminum extrusion with fins allowing natural convection cooling of the housing body. The lamp is also convention cooled through vent holes located at both top and bottom of the housing. Light baffle plates allow minimal light leakage while allowing efficient cooling of the lamp. The housing is mounted on a one inch diameter post with a 1/4-20 threaded stud. The post and/or baseplate can be removed for use with other Newport optical mounts and mounting posts.

2.2 Power Supply Assembly

The power supply is a convection cooled, AC line operated unit which contains all the necessary user controls for operating the instrument.

The function of each panel control, indicator light, and panel connector is described in the Operation-Controls and Indicators Section 3.2 of this manual.

Figure 3 is a Functional Block Diagram of the Model 780. Please refer also to the schematic diagram in the Apendix, Section 5.1.

The power supply is a linear, DC current controlled, series pass regulator type. The power section itself consists of T1, D8–9, C8, Q2, Q3, andd R39–R41. Op-amp Z1C compares the lamp current feedback signal from R39 to the reference voltage at the output of Z1A and generates an error signal to drive power transistors Q2 and Q3. VREF1, together with R14, R15, R16 forms a limiter which prevents lamp current from exceeding a safe level of 4.4 amps.

Two voltage supplies are used to power the control circuits: regulated +12VDC consisting of T2, D4–5, C6, and VREG1 to power the op-amps and indicators; and +5VAC consisting of T2, D6–7, C7 to power the thermoelectric cooler.

The light intensity regulator circuit consists of CS1, Z1A, and Z1B. CS1 supplies precision regulated constant current to R1 and R2 to generate an *Intensity Reference* voltage of approximately 10 volts at the input to Z1A. Z1A compares this input to the feedback signal generated by the photodiode and amplified by Z1B. The resultant error signal amplified by Z1A is sent to the input of the lamp power supply. R38 is adjusted to obtain proper closed loop DC gain.

The temperature of the photodiode in the lamp housing is tightly controlled at approximately 25°C. This is accomplished by Z1D, Q1, and thermistor RTA located at the photodiode. R6, R7, R8 and the thermistor form a balanced bridge at 25°C. Bridge imbalance is amplified by Z1D which drives Q1, thereby supplying current to the thermoelectric cooler in the lamp housing. The temperature of the photodiode is thus regulated by controlling the rate at which heat is pumped out of the photodiode.

Status indicators are controlled by op-amp comparators Z2A–D and drivers Z3A–F. The *LAMP* status indicator will change from green to red if the lamp current drops below 3 amps. Comparator Z2B will switch causing drivers Z3C–D to change state.

The *REGULATOR* status indicator will change from green to red if the voltage output of Z1A falls outside of a range corresponding to the acceptable lamp operating current range of 3 to 4.4 amps.

The *HOUSING TEMP* status indicator will change form green to red if the lamp base assembly temperature exceeds approximately 65°C. This is sensed by RTB which forms a bridge with R20, R22, and R23. Bridge imbalance switches comparator Z2A causing drives Z3A–B to change state.

2.3 700 Series Lamp Product Optional Accessories

A variety of accessories are available all of which are used to modify the output light of the lamp. See Figure 1.

2.3.1 Filters and Filter Holder

The Model 772 filter holder accommodates five circular filters up to 5mm thick and 30mm diameter, including any of the Model FS-4R Filters sold by Newport. Two adaptor rings included can be used to hold any 1.0 inch or 25mm diameter filters or lenses. Six one mm thick filter spacer rings are furnished to be used with filters less than 5mm thick.

1-3/8×18 threads (one end internal, the other end external) allow mating to the lamp focusing lens assembly as well as other 700 series accessories.

2.3.2 Lens Adaptors

These adapt common lens assemblies to the 1-3/3×18 thread system used in the 700 Series lamps.

Model 774-C — Adapts 1-32 C-mount
Model 774-M — Adapts .800-36 AMO standard microscope objective
Model 774-P — Adapts standard 49mm filter thread for use with reverse mounted 35mm format photographic lenses.

2.3.3 Fiber Optic Bundles and Adaptors

A series of single and dual fiber optic bundles for illumination purposes are available together with an adaptor chuck to position the fiber bundle input surface at the primary focus of the lamp.

Model 733 Fiber Optic Adaptor—

This accessory consists of a chuck plate and retainer ring which is installed in place of the aperture plate located in the nosepiece of the lamp housing assembly. Before installation of the Fiber Optic Adaptor, the aperture plate must be removed.

Model 775/777 Fiber Optic Bundles—

All bundles in this series have a 1/8 inch bundle diameter and are fitted with metal ferrules at the input end which mate with the Model 773 Adaptor.

Model 775-1 Single Bundle, 12″ length
Model 775-2 Single Bundle, 24″ length
Model 775-3 Single Bundle, 39″ length
Model 777-1 Bifurcated Bundle, 12″ length

LAMP POWER SUPPLY SPECIFICATIONS AND OPERATING CHARACTERISTICS

Power Requirement: 100/115/230 VAC 50/60 Hz.
1 amp @ 115 VAC .5 amp @ 230 VAC

Fuse: Type 3AG, 2 amp, 250 volts

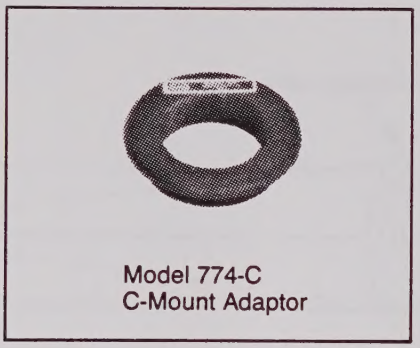
Size: 5.5″H×7″W×10″D

Intensity Adjustment Range: 80% to 100% full lamp rating

System Intensity Stability: 10 min: .05%
(Drift at 100% nom-output after warmup) 1 hr: .10%

Status Indicators: Two-color (reg/green) LED:
REGULATOR—out of control range
HOUSING TEMP—exceeds 65°C
LAMP—open lamp filament

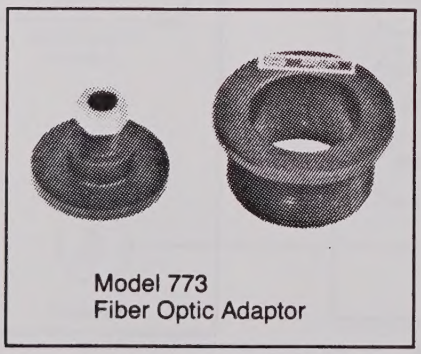
Output Signal: From panel BNC connector to monitor signal level corresponding to sensed light output intensity. +10 volts at 100% intensity.



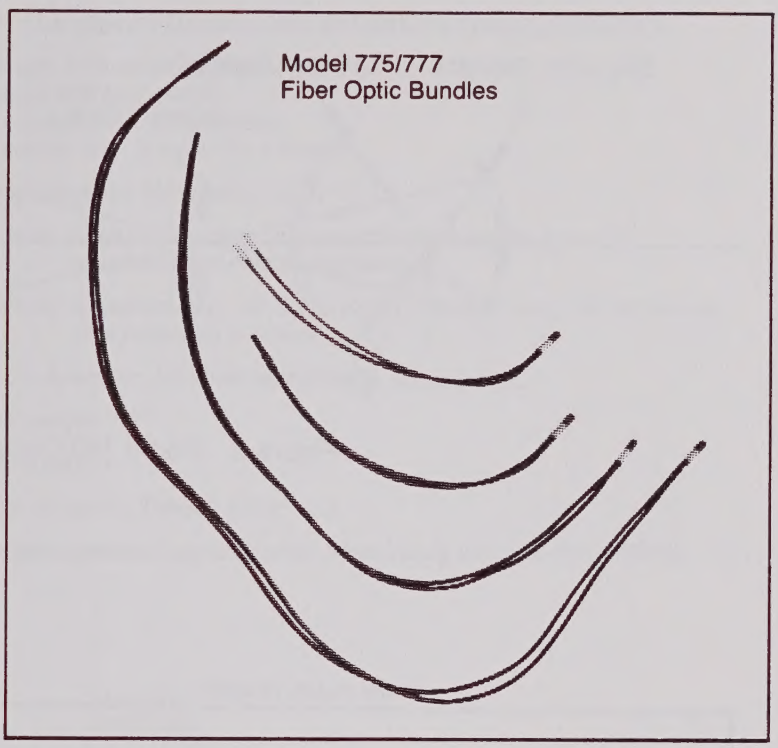
Model 774-C
C-Mount Adaptor

Model 774-M
Microscope Objective Adaptor

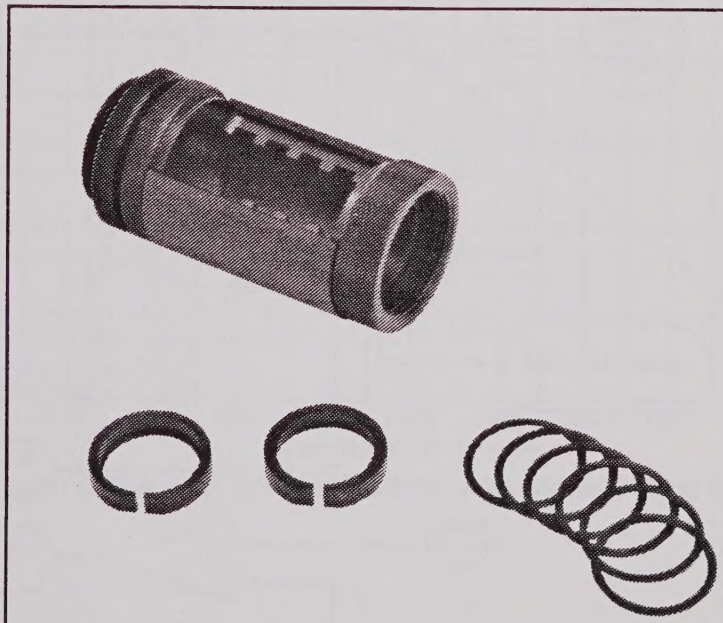
Model 774-P
Photographic Lens Adaptor



Model 773
Fiber Optic Adaptor



Model 775/777
Fiber Optic Bundles



Model 772
Optical Filter Holder

Figure 1. 700 Series Lamp Accessories

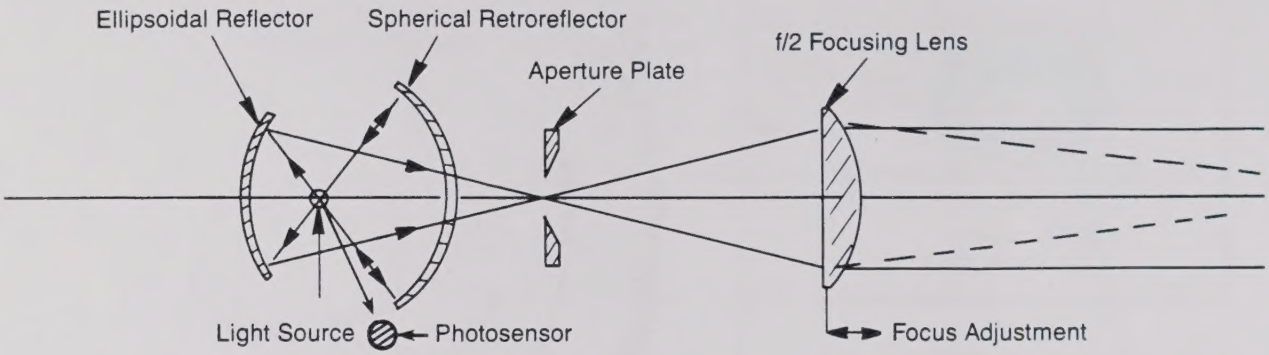


Figure 2. Model 780 Optical Schematic

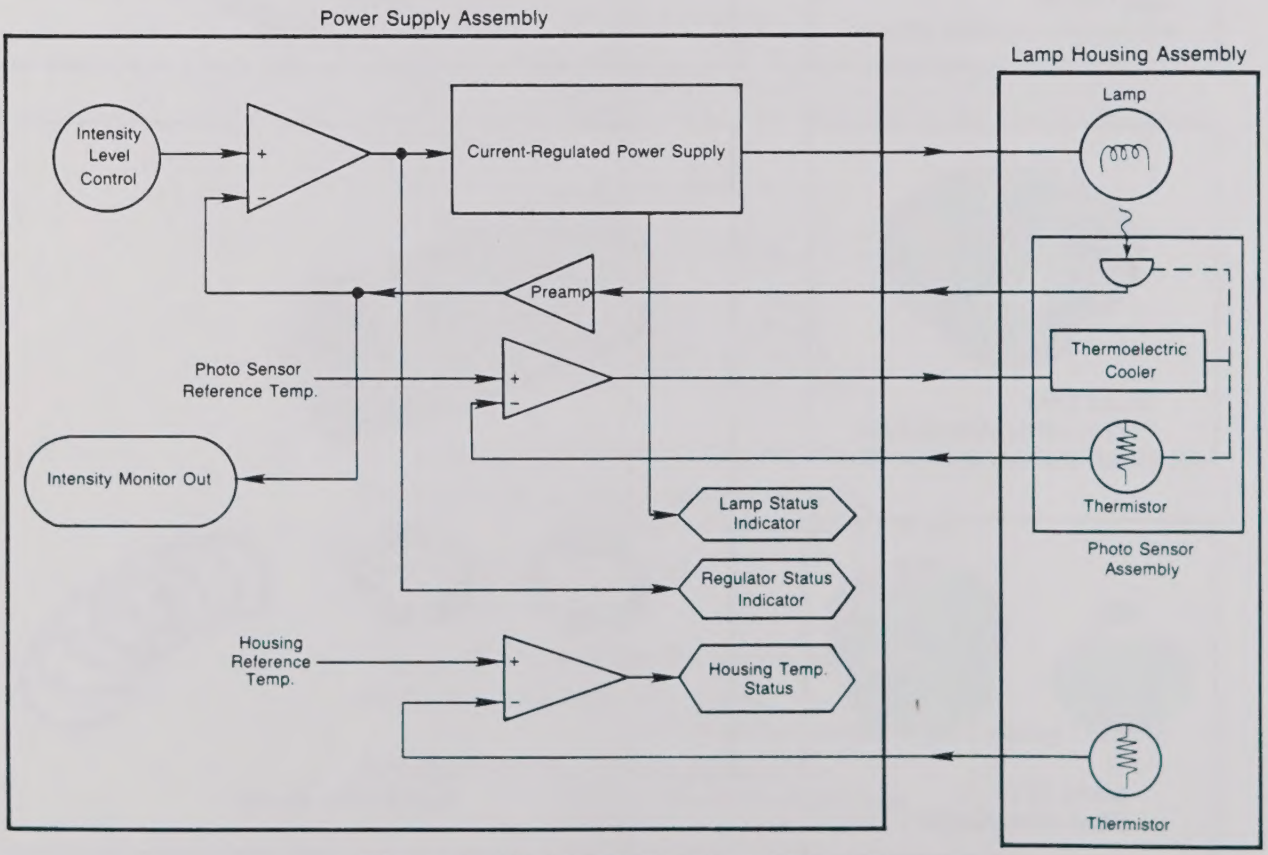


Figure 3. Model 780 Functional Block Diagram

LAMP SYSTEM SPECIFICATIONS AND OPERATING CHARACTERISTICS

Lamp: 12 volt, 4.25 amp tungsten-halogen projector lamp
Osram P/N HLX 64610
Luminous Flux: 1550 lumens
Filament Size: 3.3mm W × 1.6mm H

Color Temperature at 100% (nom): 3200°K.

Power Output: Approx. .8 watts as measured through focusing lens by broadband pyroelectric radiometer

Lamp Lifetime: Approximately 100 hours at full intensity. Lamp life doubles for 15% reduction in intensity.

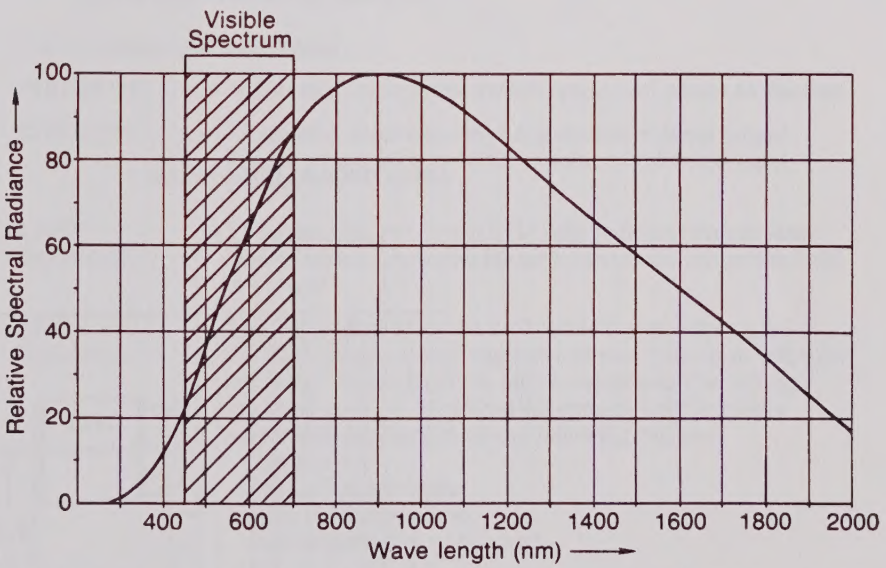
Prime Focus Aperture: .1875" dia. (6/32")

Lens Focal Length: 2.0"

Lens Clear Aperture: 1.0"

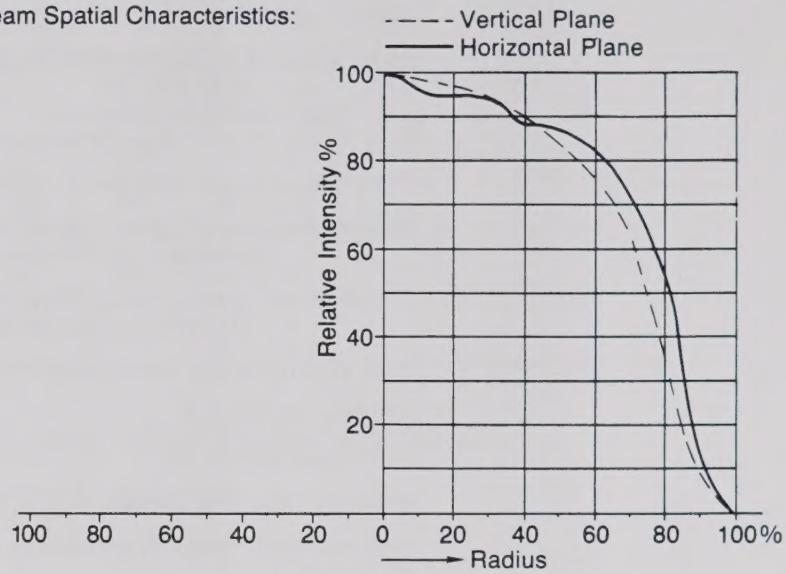
Accessories Mounting Thread: 1-3/8" × 18

Spectral Characteristics: Approximately a blackbody curve at about 3200K:



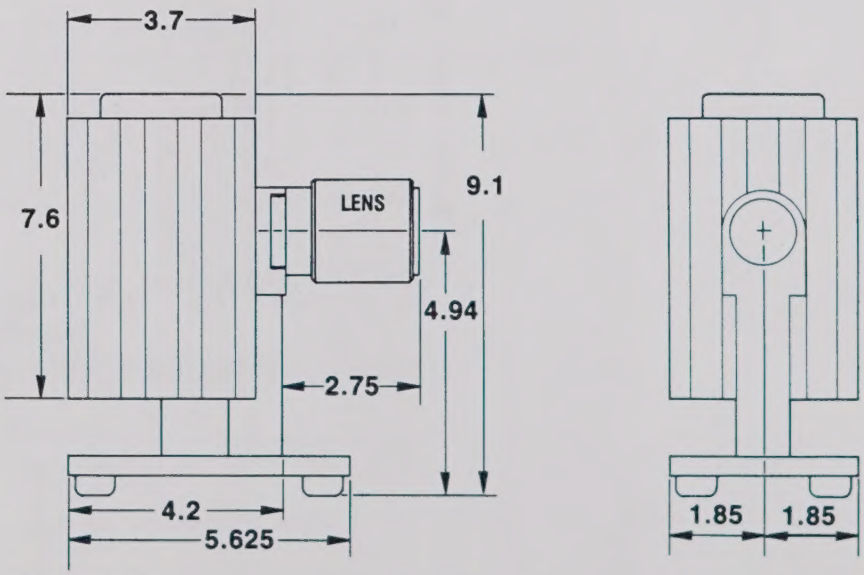
Distribution of Relative Spectral Radiance for Model 780 at 3200K

Beam Spatial Characteristics:



Beam Intensity Profile Model 780

Lamp Housing Dimensions:



All dimensions in inches.

MODEL 780

3.0 OPERATION

3.1 First Time Operating

For operation after initial receipt of the equipment or for operation by persons unfamiliar with the Model 780, the following guidelines should be followed.

a. Inspect the position of the jumper card located in the line cord connector socket on the power supply rear panel. The card should display the AC line voltage corresponding to the actual line voltage to be used. Four positions of this card are possible: *100, 120, 220, 240* volts. As necessary, remove and reinsert the card to select the proper line voltage.

b. Connect the cable from lamp housing to the connector at the rear of the power supply. Connect the power supply line cord to the AC line.

c. Set the INTENSITY control to midrange and depress the POWER switch to the ON position. The lamp should now be illuminated.

d. Check lamp alignment and centering by projecting the output beam onto a white or light-colored surface several feet from the lamp and look for uniform light intensity across the field. Adjust the three thumbscrews located at the bottom of the housing until the brightest, most uniform light field is obtained.

e. Rotate the INTENSITY control fully clockwise and confirm that the REGULAR indicator light remains green. If red, sensor gain adjustment may be required. See Section 4.2.

3.2 Controls and Indicators

POWER ON — Illuminated rocker type switch applies AC power to the unit.

INTENSITY — A one turn control to allow adjustment of lamp output intensity from 80% to 100% of value at full rated input power.

LAMP (Indicator) — This two color red/green LED light indicates proper lamp load condition. An open filament circuit will cause the light to glow red.

REGULATOR (Indicator) — This two color red/green LED light indicates the status of the light output control regulator circuit. The lamp will turn red when the controller is out of regulation. For example, the lamp may not be delivering enough light to satisfy sensor demand for any of the following reasons:

Lamp aged
Lamp filament open
Line Voltage too low
Sensor defective or blocked.

HOUSING TEMP (Indicator) — This two color red/green LED light indicates housing temperature status. If the lamp base plate temperature rises above approximately 65°C, the lamp will indicate red.

INTENSITY MONITOR OUT — Output signal which can be used to monitor the light output level. Voltage at full lamp intensity is +10 volts.

Output impedance—approximately 10,000 ohms

4.0 MAINTENANCE

4.1 Lamp Replacement and Alignment

Replacement lamps can be ordered from Newport Corporation. Specify "Model 781 Lamp."

a. Remove the lamp base assembly from the housing by unscrewing three button head fasteners at bottom of housing assembly carefully and withdrawing the base assembly from the housing.

b. Replace lamp in socket.

c. Reinstall lamp base assembly into housing.

d. Turn the lamp on and focus the lens assembly to image the aperture on a light surface several feet from the lamp.

e. Adjust the three thumbscrews at the bottom of the baseplate to center the filament image within the aperture circle and to attain the brightest image of the filament.

f. Perform the SENSOR AND GAIN ADJUSTMENT in Section 4.2.

4.2 Sensor Amp Gain Adjustment Procedure

This procedure calibrates the INTENSITY LEVEL operating point to produce maximum output intensity at full lamp power rating. Trimpot R38 is accessed by through a hole in the bottom panel of the supply. The access hole is located toward the rear on the lamp cable connector side.

a. Remove the top panel from the power supply. Monitor the voltage between test points TP1 and TP3 with a DC voltmeter.

b. Withy the *INTENSITY LEVEL TRIM* control fully clockwise, adjust R38 until the voltage reads +.425VDC. Replace top panel.

4.3 Mirror Alignment

The light collection mirrors are adjusted and aligned at the factory. User adjustment is not recommended. If mirror replacement is necessary, the unit should be returned to the factory.

5.0 APPENDIX

5.1 Schematics, Parts Lists, Assembly Drawings

780 Schematic — 05035

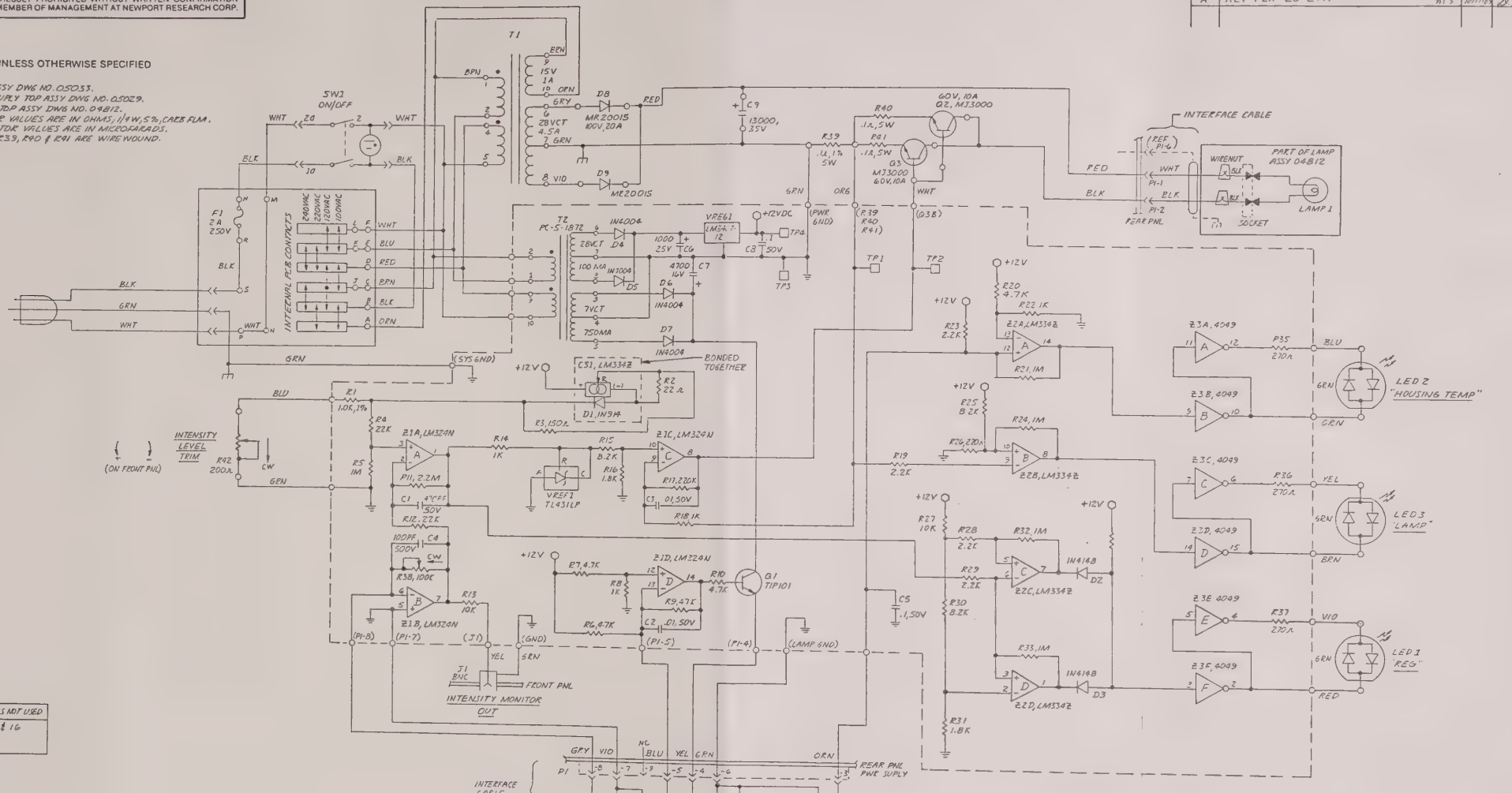
780 PCB Assembly — 05033

DOCUMENT IS THE PROPERTY OF NRC AND IS CONSIDERED COMPANY IFIDENTIAL. THE REPRODUCTION OR USE OF INFORMATION HEREIN, ALL IN PART, IS EXPRESSLY PROHIBITED WITHOUT WRITTEN CONFIRMATION M A PRINCIPAL MEMBER OF MANAGEMENT AT NEWPORT RESEARCH CORP.

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	REV PER ED 2447	10/11/82	

NOTES: UNLESS OTHERWISE SPECIFIED

1. REF. PCB ASSY DWG NO. 05033.
2. REF. PWR SUPLY TOP ASSY DWG NO. 05029.
3. REF. LAMP TOP ASSY DWG NO. 04812.
4. ALL RESISTOR VALUES ARE IN OHMS, 1/4 W, 5%, CARB FLM.
5. ALL CAPACITOR VALUES ARE IN MICROFARADS.
6. RESISTORS R39, R40 & R41 ARE WIRE WOUND.



I.C. PINS NOT USED
Z3, 13 & 16

I.C. PWR PINS		
I.C.	VCC	GND
Z1&2	4	11
Z3	1	8

LEGEND
- ○ = + SUPPLY VOLTAGE
- ○ = WIRE OR COMPONENT TERMINATION
- □ = TEST POINT
- ⏚ = SIGNAL GND
- ⏚ = CHASSIS GND

QTY REQD PER DASH NO.	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	DATA, SPECIFICATION, SIZES, SUPPLIERS	SEE NOTE	SH	DES ZONE	ITEM NO

PARTS LIST

SEE ENGINEERING RECORDS FOR COMPLETE APPLICATION DATA

NEXT ASSY	TOP ASSY	MOD NO.
05029	05029	780
05029	04812	780

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES:
XXX = ± ANGLES = ±
XX = ± FRACTIONS = ±
SURFACE FINISH = 63 OR BETTER
DEBURR & BREAK ALL SHARP EDGES
DRAWING IN ACCORDANCE WITH ANSI-Y14.5-1973

MATERIAL

CONTRACT NO

DWN BY	NDM	4-30-82
CHK BY		
RESP ENGR		7/5/82
DESIGN ACTIVITY APPROVAL		

NRC newport corporation
18235 Mt. Baldy Circle Fountain Valley, Ca 92708

SCHEMATIC, QUARTZ TUNGSTEN LAMP SYS
MODEL 780

SIZE	CODE IDENT NO.	DWG NO.	REV
D		05035	A

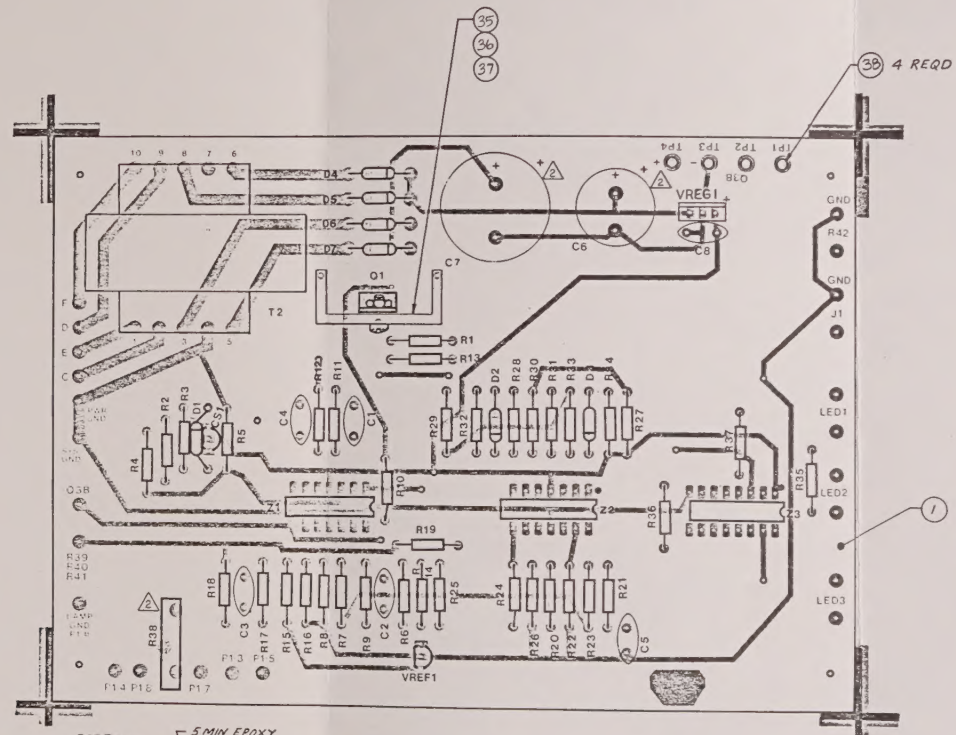
SCALE NONE | WT | SHEET 1 OF 1

IS DOCUMENT IS THE PROPERTY OF NRC AND IS CONSIDERED COMPANY
NFIDENTIAL. THE REPRODUCTION OR USE OF INFORMATION HEREIN, ALL
IN PART, IS EXPRESSLY PROHIBITED WITHOUT WRITTEN CONFIRMATION
OM A PRINCIPAL MEMBER OF MANAGEMENT AT NEWPORT RESEARCH CORP.

REVISIONS				
REV	DESCRIPTION		DATE	APPROVED
B	UPDATED DWG, NO CHANGES MADE	KRR	12/24/80	dVeil
C	REV PER EO 05033C		6/2/83	HK
D	REV PER EO. 1591	C	5/14/18	PM
E	REV PER EO 1941	GP	11/11/88	PM
F	REV PER EO 2254 (ADDED D/L SHT 2)	GP	6/1/89	PM
G	REV PER EO 2447	MS	11/16/89	

NOTES: UNLESS OTHERWISE SPECIFIED

1. REMOVE ALL SOLDERFLUX FROM COMPONENT LEAD SOLDERJOINTS WITH VAPOR DEGREASER TUB USING 1-1-1 TRICHLORETHANE, SEE NOTE 2.
2. ALL COMPONENTS SHOWN WITH A 2 ARE NOT TO BE EXPOSED TO TRICHLORETHANE. PERMANENT DAMAGE WILL RESULT.
3. REF, SCHEMATIC DWG NO. 05035.



QTY REQD PER DASH NO.	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	DATA: SPECIFICATION, SIZES, SUPPLIERS	SEE NOTE	SH ZONE	DES ZONE	ITEM NO.
			PARTS LIST					

SEE ENGINEERING RECORDS FOR COMPLETE APPLICATION DATA

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES:
XXX = ± ANGLES = ±
XX = ± FRACTIONS = ±
SURFACE FINISH = 63 OR BETTER
DEBURR & BREAK ALL SHARP EDGES
DRAWING IN ACCORDANCE WITH ANSI Y14.5-1973

CONTRACT NO.

DWN BY REK 11/15/84
CHK BY NH 12/21/84
RESP ENGR T Kurowski 12/24/84
DESIGN ACTIVITY APPROVAL

Newport Corporation
18235 Mt. Baldy Circle P.O. Box 8020, Fountain Valley, CA 92728-8020
Phone (714) 963-9811 Telex 685530

PCB ASSY-780

05029	05029	780
NEXT ASSY	TOP ASSY	MOD NO.

APPLICATION

MATERIAL

SIZE	CODE IDENT NO.	DWG NO.	REV
D		05033	G

SCALE 2/1 WT SHEET 1 OF 2

P/N 12940
IN-07871 (Rev. 4-27-89)

Newport

U.S. Headquarters:
Newport Corporation
P.O. Box 8020 / 18235 Mt. Baldy Circle
Fountain Valley, CA 92728-8020
Telephone: 714-963-9811
Facsimile: 714-963-2015

European Headquarters:
Federal Republic of Germany
Newport GmbH
Telephone: 06151-26116
Facsimile: 06151-22639

United Kingdom:
Newport Ltd
Telephone: 0582-769995
Facsimile: 0582-762655

Switzerland:
Newport Instruments AG
Telephone: 01-740-2283
Facsimile: 01-740-2503

Canada:
Newport Instruments Canada
Telephone: 416-567-0390
Facsimile: 416-567-0392